

## **NIST Image Group Open Source (NIGOS)**

June 15, 2006

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This document provides instructions for accessing a new service (NIGOS) provided by the NIST Image Group. An open source server has been set up to facilitate biometric technology transfer and collaboration through formal software management controls.

Initial access to NIGOS is provided as read-only as described below. Policies and procedures for issuing “developer” privileges and the ability to contribute to the open source projects through the source code server are currently being drafted. In the meantime, developer status will be considered on a case by case basis.

### **Current NIGOS Projects**

- **MBARK**

Email Contact: [mbark@nist.gov](mailto:mbark@nist.gov)

Project View: `//depot/projects/MBARK/Main/...`

Project Description:

MBARK is a reference implementation for an externally deployable, multi-modal biometric acquisition and information system. MBARK may be used in operational settings to collect and maintain biometric data along with their defining characteristics.

- **BIOMDI**

Project View: `//depot/projects/BIOMDI/...`

Email Contact: [wsalamon@nist.gov](mailto:wsalamon@nist.gov)

Project Description:

The BIOMDI project contains libraries and programs used to read, write, and present minutiae records that conform to these ANSI INCITS standards:

INCITS 378 - Fingerprint Minutiae Format Data

INCITS 381 - Fingerprint Image Data

INCITS 385 – Face Image Data

ISO/IEC 19794 – Fingerprint Minutiae Data

See <http://www.itl.nist.gov/iad/894.03/nigos/biomdi.html> for details on the PIV program.

- **BIOMAPP**

Project View: `//depot/projects/BIOMAPP/...`

Email Contact: [wsalamon@nist.gov](mailto:wsalamon@nist.gov)

Project Description: The BIOMAPP project contains applications that make use of the libraries in BIOMDI :

matchoncard – Libraries and programs for testing match-on-card fingerprint matching functionality. Also included is a library to parse Tag-Length-Value encoded objects.

piv – Libraries and programs to create and verify biometric records formatted for the Personal Identity Verification project. This code was previously distributed in the INCITS Perforce project.

- NBIS

Project View 1: //depot/projects/NBIS/Rel\_3.3.0/...  
//depot/projects/NBIS/Test\_3.3.0/...

Project View 2: //depot/projects/NBIS/Rel\_3.2.0/...  
//depot/projects/NBIS/Test\_3.2.0/...

Project View 3: //depot/projects/NBIS/Rel\_3.1.0/...  
//depot/projects/NBIS/Test\_3.1.0/...

Project View 4: //depot/projects/NBIS/Rel\_3.0.0/...  
//depot/projects/NBIS/Test\_3.0.0/...

Project View 5: //depot/projects/NBIS/Rel\_2.0.0/...  
//depot/projects/NBIS/Test\_2.X.X/...

Project View 6: //depot/projects/NBIS/Rel\_1.2.0/...  
//depot/projects/NBIS/Test\_1.X.X/...

Project View 7: //depot/projects/NBIS/...

Note: The above Project Views are the possible view to set on your client view.

Project View 1 is the latest NBIS 3.3.0 stable release with ANSI/NIST-ITL 1-2007 Standard with the designed test cases directory Test\_3.3.0.

Project View 2 is the latest NBIS 3.2.0 stable release with ANSI/NIST-ITL 1-2007 Standard with the designed test cases directory Test\_3.2.0.

Project View 3 is the latest NBIS 3.1.0 stable release with ANSI/NIST-ITL 1-2007 Standard with the designed test cases directory Test\_3.1.0.

Project View 4 is the latest NBIS 3.0.0 stable release with ANSI/NIST-ITL 1-2007 Standard with the designed test cases directory Test\_3.0.0.

Project View 5 is the latest NBIS 2.0.0 stable release with ANSI/NIST-ITL 1-2000 Standard with the designed test cases directory Test\_2.X.X.

Project View 6 is the latest NBIS 1.2.0 stable release with ANSI/NIST-ITL 1-2000 Standard with the designed test cases directory Test\_1.X.X.

Project View 7 which will include all the Project View 1, 2, 3, 4 and 5.

Email Contact: [nbis@nist.gov](mailto:nbis@nist.gov)

Project Description:

The NIST Biometric Image Software (NBIS) distribution is developed by the National Institute of Standards and Technology (NIST) for the Federal Bureau of Investigation (FBI) and Department of Homeland Security (DHS). This software has been determined to be outside the scope of the EAR (see Part 734.3 of the EAR for exact details) as it has been created solely by employees of the U.S. Government; it is freely distributed with no licensing requirements; and it is considered public domain. Therefore, it is permissible to distribute this software as a free download from the internet.

The NBIS utilities fall under seven general categories:

- A neural-network based fingerprint pattern classification system called, PCASYS, automatically categorizes a fingerprint image into the class of arch, left or right loop, scar, tented arch, or whorl. This is an updated system that includes the use of a robust Multi-Layered Perceptron (MLP) neural network. It is the only known no cost system of its kind.
- A minutiae detector called, MINDTCT, automatically locates and records ridge ending and bifurcations in a fingerprint image. This system includes minutiae quality assessment based on local image conditions. The FBI's Universal Latent Workstation uses MINDTCT, and it too is the only known no cost system of its kind.
- A fingerprint image quality algorithm, NFIQ, which analyses a fingerprint image and assigns a quality value of 1 (highest quality) 5(lowest quality) to the image. Higher quality images produce significantly better performance with matching algorithms. The ability to retrain the NFIQ weights is provided with the utilities FING2PAT, ZNORMDAT, and ZNORMPAT.
- A reference implementation of the ANSI/NIST-ITL 1-2007 (AN2K) "Data Format for the Interchange of Fingerprint, Facial, Scar Mark & Tattoo (SMT) Information" standard is included. This reference implementation contains a suite of utilities designed to read, write, edit, and manipulate files formatted according to this interchange standard. The utilities support updated and new record types introduced by this latest version of the standard (Record Types 9, 13, 14, & 15).
- A large collection of general-purpose image utilities (IMGTOOLS) are also included to support the processing of fingerprint images. Source code is provided for Baseline JPEG, Lossless JPEG, and the FBI's Wavelet Scalar Quantization (WSQ) encoders and decoders. (The Baseline JPEG code uses the Independent JPEG Group's compression/decompression libraries.) Utilities are also provided that support color component interleaving, colorspace conversion, and format conversion of legacy files distributed in NIST fingerprint databases.
- A fingerprint matching algorithm, BOZORTH3, which is a minutiae based fingerprint matching algorithm. It will do both one-to-one and one-to-many matching operations. It accepts minutiae generated by the MINDTCT algorithm.

- A fingerprint segmentation algorithm, NFSEG, which will segment the four-finger plain impression found on the bottom of a fingerprint card into individual fingerprint images or it can be used to remove white space from a rolled fingerprint image.

## **Accessing NIGOS**

The NIST open source server uses the Perforce source code management system. To access the NIST server, you'll need to obtain a free Perforce client from:

[www.perforce.com/perforce/loadprog.html](http://www.perforce.com/perforce/loadprog.html)

Also, read the Perforce introduction at:

[www.perforce.com/perforce/doc.052/manuals/intro/intro.pdf](http://www.perforce.com/perforce/doc.052/manuals/intro/intro.pdf)

To obtain a copy of the source code from a UNIX or LINUX client, you must use the 'public' account to create a view of the Perforce depot. (Instructions may vary for Microsoft Windows users, but client software and documentation is available from Perforce.) Setting these environment variables will be needed:

```
P4USER=public
P4PASSWD=NISTPublic
P4PORT=nigos.nist.gov:1666
```

Then create a client view using the 'p4 client' command. You can use the default view to access the entire depot, or create a smaller view of just the source code projects of interest by changing the 'View:' clause to:

```
View:
//depot/projects/... //<client>/projects/...
```

where <client> will be the name of your client workstation, by default. You can override this by setting the P4CLIENT environment variable before running the 'p4 client' command. The client name shows up as the Client: clause in the view.

If you want, for example, just the MBARK primary development source code, set the View: to:

```
//depot/projects/MBARK/Main/... //<client>/projects/MBARK/Main/...
```

The view for BIOMDI is:

```
//depot/projects/BIOMDI/Main/... //<client>/projects/BIOMDI/Main/...
```

Once you have the client view saved, you can obtain the source code by updating your client view, using the 'p4 sync' command. Note: Once you sync, the Perforce server will consider your view up to date, so another sync won't pull any more. If you want to sync again (if you deleted the client copy, for example), use the 'p4 sync -f' command, which forces a new retrieval from the depot.

If after consulting the Perforce documentation you are still experiencing trouble with installing your Perforce client, you can contact us by sending email to [nigos@nist.gov](mailto:nigos@nist.gov). After successful connection and software download, please take a moment to register by following the instructions in [http://www.itl.nist.gov/iad/894.03/nigos/NIGOS\\_User\\_Registration\\_91306.pdf](http://www.itl.nist.gov/iad/894.03/nigos/NIGOS_User_Registration_91306.pdf).

**NIGOS License:**

This software was developed at the National Institute of Standards and Technology (NIST) by employees of the Federal Government in the course of their official duties. Pursuant to title 17 Section 105 of the United States Code. This software is not subject to copyright protection and is in the public domain. NIST assumes no responsibility whatsoever for use by other parties of its source code or open source server, and makes no guarantees, expressed or implied, about its quality, reliability, or any other characteristic.

**NIGOS Disclaimer:**

Specific hardware and software products identified in this open source project were used in order to perform technology transfer and collaboration. In no case does such identification imply recommendation or endorsement by the National Institute of Standards and Technology, nor does it imply that the products and equipment identified are necessarily the best available for the purpose.